

Accelerator Systems Division Highlights Ending April 2, 2004

ASD/LANL: Warm Linac

HIGH-POWER RF (WBS 1.4.1.1)

Accomplishments This Week: (1) *805-MHz, 5-MW Thales klystrons*: SN-5 testing is still in progress at LANL. Factory acceptance tests are complete for SN 7. The SN 8 factory test is now scheduled for Apr 14, and SN 9 is scheduled for Apr 28. (2) *805-MHz, 550-kW Thales klystrons*: We finished LANL acceptance tests of SN 8 and were planning on removing this klystron and installing the next 550-kW klystron. However, while removing SN 8 we found that a tuning post in the miter bend had fallen off and was attached to the center of the waveguide about two feet away. We are investigating why this happened and plan to repeat the SN 8 tests. We received SN 13, SN 14 and SN 15 this week, and SN 17 passed the factory acceptance test. The factory test of SN 16 is in progress, and the test for SN 5 is now scheduled for Apr 8. (3) *805-MHz, 550-kW CPI klystrons*: We witnessed the factory test and approved the data for SN 56. (4) *805-MHz, 5-MW AFT circulators*: One circulator passed the high-power tests and was shipped to ORNL this week. Two circulators failed the tests; one was sent back to AFT and the other was cleaned by AFT and re-installed on the test stand. Testing will commence once the high-voltage converter modulator (HVCM) is operational. Two circulators were shipped from ORNL to LANL for high power testing. (4) *ORNL Installation support*: A team of three was at ORNL this week to help with installation.

Concerns & Actions: (1) 5-MW klystrons was hampered by problems with the SCR controller that powers the prototype HVCM (see below). (2) Thales engineers were at LANL this week. They have been fixing water leaks in the 550-kW klystron magnets, and they replaced three sockets with a new socket design.

HIGH-VOLTAGE POWER CONDITIONING (WBS 1.4.1.2)

Concerns & Actions: The Dynapower SCR unit for the prototype HVCM is mis-triggering; this is typical of both controllers at LANL. The problem is in the gate firing board, where circuits are not well referenced to the SCR cathode and have a high capacitance to ground. This capacitance causes displacement currents through the trigger boards, possibly causing the mis-triggers. We have improved performance considerably, but the unit still mis-triggers occasionally.

DRIFT-TUBE LINAC (WBS 1.4.2)

Accomplishments: (1) Tank-6 slug tuners were shipped from Integrated Machine to ORNL. (2) Tank-5 post couplers are being final machined and inspected. The tip of PC 5-21 was machined incorrectly, and was repaired at Kaehr Plating. We expect this unit to be back at CMI on 4/2 or 4/5, and all Tank-5 post couplers should be ready for shipment to ORNL early next week. (3) Tank-6 post couplers were shipped from CMI to ESCO on 3/31. ESCO finished welding on 4/1, and following leak checking, they will be shipped to CMI for final machining. Pete Smith is transferring to his home group on 4/5, but he will monitor final processing at CMI until the last post coupler is sent.

COUPLED CAVITY LINAC (WBS 1.4.4)

Accomplishments: (1) Module 3 has been final tuned and is being prepared for shipping on 4/10. (2) Module 4 is fabricated and brazed, and the segments have been placed on the girder and aligned. Anticipated ship date is 4/23. (3) LANL hardware deliverables for the inter-segment regions are complete except for some beam-tube rework underway at ESCO. The projected ship date for these components is 4/8. (4) N. Bultman will travel to ACCEL for the last time on 4/19 to oversee shipment of the remaining project equipment that is being returned to LANL and ORNL.

PHYSICS & DIAGNOSTICS (WBS 1.4.5)

Accomplishments: (1) *BPM Electronics*: We shipped 47 complete units to ORNL. Three more units are being assembled and will be shipped next week. These shipments plus the 26 units already delivered bring the total to 76 units at ORNL. (2) *Wire-scanner electronics*: All units are at ORNL. S. Armijo will travel to ORNL in two weeks for final assembly. (3) *Wire-scanner pickups*: We received the 8-inch prototype, and it has been tested and is ready to be shipped. The 12-inch prototype is expected at LANL early next week (4) *RTBT harp*: We are expecting the sample ceramic harp cards from Macro-Metalics within a week. (5) *Transition-region beam stop and wire-scanner vacuum box*: The support legs were received from CMI this week, and final assembly is underway.

PROJECT MANAGEMENT (WBS 1.4.5)

Accomplishments: (1) PCR's LI-04-011 (RF Power), LI-04-012 (LLRF) and LI-04-014 (Diagnostics) were approved this week. All were zero-cost PCR's that aligned the remaining work in these areas with agreed-on work scope changes. (2) After nearly 5 years of existence, the Los Alamos SNS Division disbanded today (Fig. 1). Beginning 4/5, our post-handoff work will be managed from LANSCE Division. Bob Hardekopf will serve as the LANL Senior Team Leader and point of contact.



Fig. 1: Final milestone for LANL SNS Division: Takin' down the sign and turnin' off the lights!

ASD/JLAB: Cold Linac

ASD/BNL: Ring

Five members of the BNL/SNS Diagnostics Group were at OR this week to deliver and set-up a prototype BPM system for testing during the upcoming DTL commissioning run.

In spite of a busy travel schedule, work continues on the Diagnostics Production plan, including scope, schedule and ETC.

It has been observed that there is some induced noise from vacuum electronics and SCR controlled power supplies. We are working with SNS/OR staff to find a solution to the noise issues.

BCM - Two modified BNL units have been delivered to OR for testing during the DTL run. We await IP addresses for remote monitoring.

BNL's Joe Mead is at ORNL this week to discuss solutions for the timing decoder.

IPM - Vacuum chamber drawings have been released for production. Mock-ups of the internal geometry (standoffs, etc.) are being fabricated for testing.

Installation drawings for the Injection straight section are in progress to support the Injection 'string' assembly at BNL and to support ASD hardware installation beginning in July '04.

The last 26S26 sextupole (#9 from Alpha Magnetics) has been fully measured.

PCR's for the Beam loss monitor (spares) and the extraction Lambertson coil (spares) were approved this week.

The fourth (last) Ring quarter-cell assembly was shipped from BNL to SNS/OR. Assembly of Ring half-cell #25 is underway.



Controls

The controls team participated this week in the successful Accelerator Readiness Review (ARR) for operation of DTL 1-3. There were zero findings, either pre-start or post-start, related to either the personnel safety systems or the machine protection system.

A PCR to reconcile the WBS 1.9 plan in the MPM system with available BA was approved this week.

At BNL, All Yokogawa function generators have been received. Motion control testing of the HEBT charge exchange foils will commence soon, simultaneously with an evaluation of the LANL-designed interface chassis. The BNL controls team is also supporting the testing of the primary stripping foil "chainsaw" device motion control.

A "punch list" for all remaining Ring Controls work was generated and is under review. The target of a January, 2005 completion appears realistic. Ring magnet systems were reviewed to make sure everything is covered – the existing Functional System Description (FSD) is being upgraded.

At LANL, export interfaces to Matlab and the EPICS Striptool were added to the data archiver. The scatter plot is working. Line colors and line styles can now be selected. CCL1 vacuum and RCCS are ready for CCL1 conditioning. On site support is being provided by Charles Pinney for this week and next.

Work on the fringe field effects is being done on XAL along with some work on the description of the beam elements. An initial attempt to integrate these changes was thwarted by some rapid changes at ORNL. Collaboration is never easy.

Proper operation of all of the control loops for the Central Helium Liquefier Main 4.5 K Cold Box has been verified. The proper operation and calibration of the signals for all available main 4.5 K cold box devices have been verified. (~15 devices need work by the vendor prior to signal verification) The Control System is ready to begin cold box commissioning.

The IOC for the first group of medium beta cryomodules was successfully booted at the site. It is currently located on the CHL mezzanine. The PLC for these cryomodules will be installed with the IOC next week to facilitate checkout of the control logic.

Tunnel wiring for cryomodules MB03 and MB04 is complete. This wiring is from the terminal strips on the ceiling to the connectors on the cryomodules. Wiring in the Klystron building PLC and IOC racks for MB 01 – 04 is complete. Wiring for the Marshalling panel for these cryomodules is 50% complete.

The test plan for medium beta cryomodels 01 - 04 was approved. Instruction "SNS-ASD-IC-CRYO-I01" (Setra Pressure Transducer Verification Instruction) and "SNS-ASD-IC-CRYO-I02" (Rosemount Flowmeter Verification Instruction) were issued for verification. The Equipment Tracking System was updated for all the Main 4.5 K Cold Box devices. All drawings related to the cryogenic controls systems were transferred to ProjectWise in accordance with a recent DOE requirement.

A dry run of the certification procedure for the Accelerator Personnel Protection System (APPS) "phase 1 lite" was completed, with certification scheduled for early next week.

Design started on the PLC cabinet for the primary shutter limit switches for the Target Personnel Protection System (TPPS).

Quality factors and trip levels of the installed Chipmunks for phase 0.4a were changed per installation request forms. Future plans for Chipmunk placement around the facility were reviewed with the Accelerator Readiness Review committee, resulting in minor changes to the existing plan. Outdoor conduit for Chipmunks around the RTBT will begin this month.

Installation

Craft Snapshot 3/31/04

ASD productive craft workers	63.0
Foremen (Pd by 15% OH)	6.0
AMSI management (Pd directly)	3.0
TOTAL AMSI WORKERS	72.0
Less WBS 1.9, 1.2 etc	4.0
Less absent	0.0
TOTAL PD BY ASD/ORNL DB WPs	59.0

Accelerator Physics

We finished high power RF conditioning of the RFQ, DTL1, DTL2, DTL3 cavities. Conditioning went very smoothly. Achieved forward power levels are, for 1ms pulse width @ 30Hz:

RFQ 800kW
 DTL1 610kW
 DTL2 1800kW
 DTL3 2100kW

Surface field in the DTL cavities exceeds the nominal by ~25% at these power levels. Average dissipated power in the cavities corresponds to ~4.8% duty factor at the nominal field strength.

We started bringing up the Front End on Thursday noon in preparation for upcoming commissioning run. By end of the same day ~10mA was transported to the MEBT beam stop.

We prepared for the radiation issues video conference to be held Apr. 5. The issues are radiation levels, both prompt and residual, at the end of the RTBT and in the ring injection area.

Work has resumed on the physics application to measure the injected beam position and angle at the stripper foil.

Work continues on the temporary view screen to be mounted on the front of the target for initial beam commissioning. We are searching for vendors who can deliver a fiber optic cable with a lens on one end and a very small video camera on the other.

A Technical Issues Forum was held last week on March 26 to discuss the XFD/ASD interface at the end of the RTBT. Graeme Murdoch and Tom McManamy gave interesting and detailed presentations.

A ring injection stripper foil meeting was held on 24/Mar. We concluded that stripper foil development will continue at least until

Operations

Ion Source Group

The front end was restarted and we measured up to 12 mA in BCM02 without cesiating the source. Unfortunately, the circuit breaker on the 2 MHz amplifier tripped several times per hour, sometimes coincidental with high voltage arcs, and sometimes for no apparent reasons. Initially we suspected the 2 MHz amplifier, where we found a blown HV capacitor. Two replacement capacitors blew up as soon as the amplifier was switched on. The capacitor was removed following QEI's advice. This, nor cleaning the HV insulation, nor rearranging the RF cable solved the problem. The best clue was obtained when we observed the timing pulse on the high voltage platform to stay high for at least 100ms after a trip occurred initiated by an arc. Sunday was used to exactly reestablish the configuration of last fall, which apparently fixed the problem.

The ion source that was operated for a total of 33 days was removed from the hot spare stand. Signs of heavy use were obvious: The extractor was partly melted by the escaping electrons, the e-dump has a thin coat of stainless steel, and the antenna had two large bare copper spots. The source will be cleaned and reconditioned.

Survey and Alignment Group

Set jack elevation in the "D" arc so that the half cells could be positioned.

Started mapping the crane trajectory and elevation as it traverses through the Lambertson and RBTT Dipole area. Unfortunately, due to demands on the crane we were not able to complete this. It has been rescheduled for next Wednesday.

Additional monuments were placed on the walls and ceiling of the downstream RTBT, for deformation monitoring. A baseline epoch of data was measured, just prior to the re-start of the backfill operation.

New elevations were measured for the HEBT and Ring floor monuments, as part of the ongoing recompression settlement study.

A level loop was run from an exterior monument to the west target shelf monuments. Some uneven settlement was detected; monuments closer to the new hot cell shielding settled more than those closer to the RTBT. An additional elevation tie is planned to determine the current elevation of the proton beam window. A report will be produced when this is done.

Work began on the annual global elevation re-observation campaign. The purpose of this campaign is to ensure that a consistent elevation datum is maintained between the extreme ends of the tunnel, and not subject to monument settlement.

Setup preliminary meeting and discussion on the alignment of the CCL Quads, BPMs, etc. This meeting is needed to plan for future alignment requirements and how the alignment process will be performed and with what instrumentation

This week, S&A performed a mock up alignment of the SCL warm section magnets. The main purpose of the mock up was verification of the warm section beam pipes. With this mock up, the straightness tests can now be performed by the SCL Group.

S&A met with the Target Group to discuss a couple of key issues having to deal with the shutter guide rails along with our core vessel flange centerlines. We reiterated that the targets located on the monolith shelf represent the centerline of the core vessel flanges to a very high degree of accuracy.

We are also continuing with the chopper cavity, bulk shield liner flange as-built measurements.

S & A is again our AutoCAD X-Ref drawing files and also our data bases. A number of items have been added in the last two weeks including CCL magnet and BPM data, additional half cell data, and ideal DTL information.

Mechanical Group

All of the CCL-1 inter-segments have been installed. Magnet power supply testing began this week.

CCL-2 vacuum connections are being made this week in preparation for leak testing which will begin next week

Anchors for the CCL-3 support stands have been installed. CCL-3 is scheduled to be delivered to the SNS site on April 12.

Ring Systems Installation

- All available (24) RING arc Half-Cell assemblies have now been installed. The shipment of the remaining 8 units will resume on April 15.
- The last of the RING arc Quarter-Cells (#D5) was received and staged for installation.
- The RING collimator (3) and RTBT collimator (2) baseplates were received and staged for installation.
- Installation of the AC distribution panels continued in the HEBT Service Building.
- Installation of the AC distribution panels continued in the RING Service Building.

Water Systems Installation

- Installation of DI water piping on SCL ME-03 continued.
- Installation of DI water piping on SCL ME-04 continued.
- Installation of DI water piping to CCL2 RF system continued.
- Installation of DI water piping to CCL3 RF system continued.
- The manufacturer's representative on DTL2 RCCS system pump which failed examined the pump and is having it sent back for repair.
- Modifications to DTL1 RCCS system were started and a new heat exchanger received.
- Installation of Linac Beam Stop chiller was completed and the unit is ready for operation.
- The HEBT Collimator Cooling System procurement was released.
- Procurement of the HEBT SB piping was started.
- Quotations for the RING SB cooling system upgrade components are being evaluated.

Magnet Task

This week we installed seven CCL Module 1 intersegment assemblies. This completes the 13 intersegments associated with Module 1.

We have mapped two Quads for CCL Module 2.

We mapped an SRF 8Q35.

Two 8Q35's are on "loan" to Dan Stout for setup into a Warm Section.

We are working on a redesign of the 21Q40 measurement system. This involves new bearings and associated

Electrical Group

We experienced an SCR bridge failure on DTL-ME1 this week while operating 3 klystrons. The bridge was promptly replaced, along with the driver board, and the system was back on line with minimal disruptions to operations. Although the exact failure mechanism is not known, the damage caused is very similar to failures which have occurred in the past on these units. The unit has been operated extensively since this event, and no additional problems are noted. We will continue to look at the driver card, MOVs, and line transients as possible sources of the failure.

The HVCM in the RFTF was brought on line again this week to support cryo coupler testing at ORNL. Operation at 80 kV, 60 Hz, and 1350 us was demonstrated with the beam stick and a CPI klystron serving as a load.

Preparations were done this week for the PPS lite certification of CCL-ME1.

SCL-ME2 rebuild work (which was near completion) was put on hold to support SCL-ME1 rebuild efforts. We will be adding additional capacitance to the peaking capacitor in an attempt to reduce the commutation current seen by the IGBTs. We expect to have Bill Reass here the week of 12Apr04 to help with this testing effort. Also, modifications are being performed on the DSP to allow us to control the duration of the gate pulses. We hope that reduction of the gate pulse duration will allow more "dead time", and thus eliminate any possibility of cross-conduction between IGBTs (shoot thru fault).

Parts for building the 20 and 40 kHz traps to reduce high frequency ripple on the cathode voltage pulse arrived this week. This will be assembled and tested as time permits.

A CCL1 quadrupole magnet has been connected to its power supply and successfully operated. Plastic shields are in place to prevent contact with energized leads. LOTO is required if these shields are removed. The remainder of the CCL1 quadrupole magnets has been installed this week and cabling to their power supplies has commenced. Next week, shields will be installed and integrated testing of magnets and power supplies will start.

The QMCS and the associated rack in SCL row 9 have been AC powered and tested

Ring main AC distribution feeders from substations to ring SB panels are 50% terminated as of this week.

HPRF

RFTF: The JLAB cryo-coupler test stand arrived Monday and was assembled and integrated into the existing RFTF 805 MHz test stand. A straight waveguide section was installed instead of the couplers to prove the interlocks and measurement instrumentation. RF power was applied through the test set into a water load. An rf leakage survey was performed at average powers of 0.5kW, 5kW and 38kW. No measurable leakage was detected. The peak power was run up to 640kW at 60Hz with a 1ms pulse width. Saturday we expect to insert the couplers with their vacuum test fixture and start to apply low power rf. RCTs have been notified to perform radiation measurement.

CCL: The water cooling interface was completed and the lead shields added to the CCL2 5MW klystron. The AFT factory representative visited for two days. He instructed our technical staff on the procedure for preparing and installing the Kapton windows on the 5 MW circulators. He also delivered the Temperature Control Unit (TCU) software and gave instructions on its use.

SCL: We continue cable termination in SCL 5 & 6 RF Stations and waveguide alignment in the SCL MB 7& 8 RF Stations.

LLRF

The first complete production FCM was shipped to LBL this weekend to undergo testing.

The FCM shield design (ground plane between motherboard and daughterboards) was completed and sent out for a quotation. We plan to place the order next week.

We expect to receive two 805 MHz AFEs next Monday. If these pass acceptance tests, then we will give approval for production of the balance of the AFEs.

Six more HPMs were shipped from the manufacturer on Friday.

The 755 MHz local oscillator distribution in the klystron gallery was turned on in the CCL area and is ready to support operation of the CCL klystrons.

Two of the MEBT Rebuncher LLRF control chassis failed recently. The problem was traced to a failed low-power RF amplifier in one chassis. A replacement will be installed on Monday. The second chassis is still under investigation. As a guard against future failures, an AC power conditioner has been installed in the RF control rack, and coaxial DC blocks and circulators will be installed on the chassis RF output channels.

The balance of the downconversion chassis for the SCL were delivered this week.

We continued to support RF conditioning in preparation for the upcoming beam commissioning run. With the exception of the MEBT Rebuncher, all systems are ready to support commissioning.

We supported the setup and operation of the RF test stand in RFTF for the testing and conditioning of SCL RF power couplers.

Cryosystem Group

Beam Diagnostics